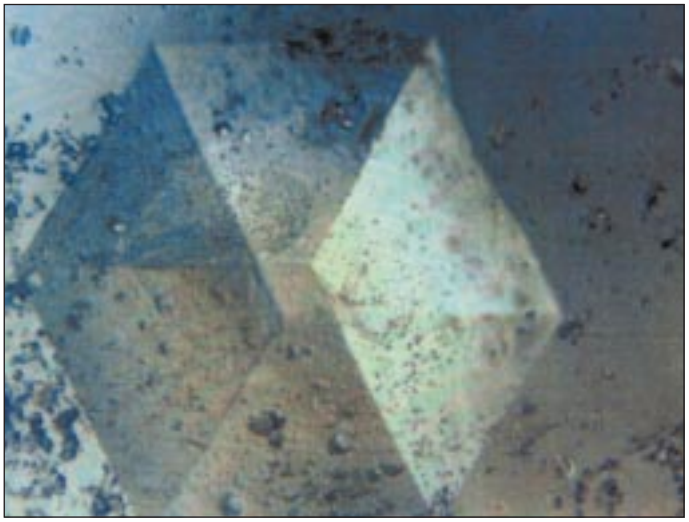
Commercial Protein Crystal Growth: Working on Tomorrow's Treatments Today

Proteins are the building blocks of our bodies, and the living world around us. Within our bodies, proteins make it possible for red blood cells to carry oxygen throughout the body, while others help transmit nerve impulses so we can hear, smell, and feel the world around us, while still others play a crucial role in preventing or causing disease. If the structure of a protein is known, then companies can develop new or improved drugs to fight the disease of which the protein is a part.



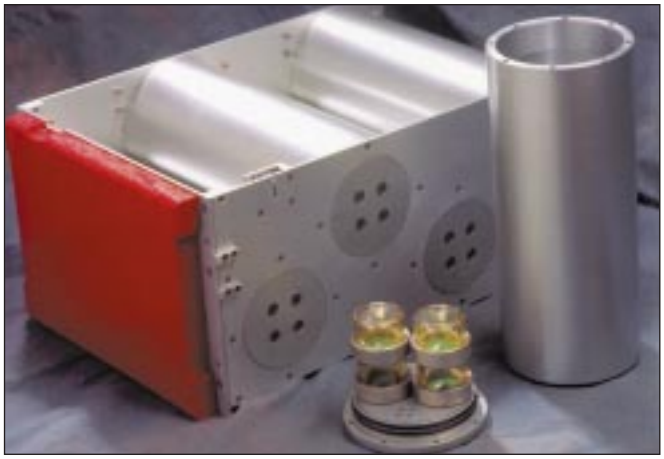
Courtesy: Center for Macromolecular Crystallography

Research on crystals of human insulin could lead to improved treatments for diabetes.

To determine the structure, researchers must grow near-perfect crystals of the protein being studied. On Earth, convection currents, sedimentation, and other gravity-induced phenomena hamper crytal growth efforts. In microgravity, researchers can grow near-perfect crystals in an environment free of these effects. Because of the enormous potential for new pharmaceutical products, the Center for Macromolecular Crystallography — the NASA Commercial Space Center responsible for commercial protein crystal growth efforts — has more than 50 major industry and academic partners.

The goal of the Commercial Protein Crystal Growth (CPCG) payload on STS-95 is to grow large, high-quality crystals of several different proteins of interest to industry, and to continue to refine the technology and procedures used in microgravity for this important commercial research.

The Protein Crystallization Facility will be used to grow crystals of human insulin. Insulin is the primary treatment for diabetes, the fourth leading cause of death by disease. Previous microgravity research with industry partner Eli Lilly and the Hauptman Woodward Medical Reseach Institute has yielded crystals that far surpass the quality of insulin crystals grown on the ground. Research on STS-95 is aimed at producing crystals of even higher quality, which when combined with new analysis techniques will permit a better understanding of the interaction between insulin and its receptor. This has the potential to aid in the development of a new commercially available insulin

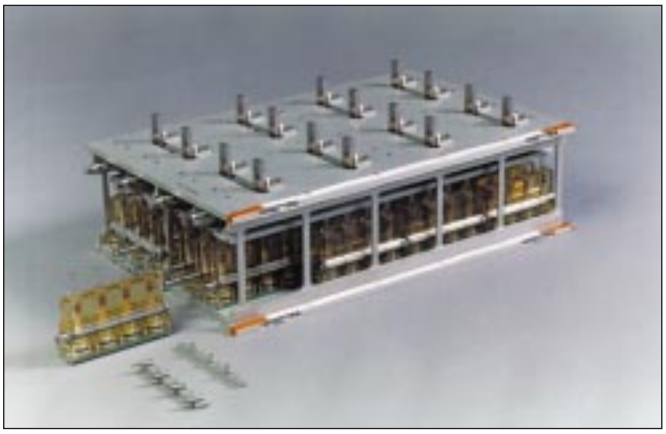


Courtesy: Center for Macromolecular Crystallography

The Protein Crystallization Facility supports large-scale commercial investigations.

product with unique time release properties that could reduce fluctuations in a patient's blood sugar level.

The Commercial Vapor Diffusion Apparatus (CVDA) will be used to perform 128 individual crystal growth investigations for commercial and science research. These experiments will grow crystals of several different proteins, including HIV-1 Protease Inhibitor, Glycogen Phosphorylase A, and NAD Synthetase.



Courtesy: Center for Macromolecular Crystallography

The Commercial Vapor Diffusion Apparatus supports multiple commercial investigations within a controlled environment.

HIV-1 Protease is an enzyme involved in the propagation of HIV, and is being studied by commercial partner Bristol-Myers Squibb as a target for potential drugs to treat people infected with HIV. Bristol-Myers Squibb is also investigating an enzyme, Glycogen Phosphorylase A, that may aid in the development of a new-generation treatment of diabetes.

NAD Synthetase is an enzyme that plays an important role in the propagation of bacterial infections. Previous research with an NAD Synthetase Complex, a combination of NAD Synthetase and an inhibitor, yielded crystals that provided the best X-ray diffraction data ever collected on that particular complex and led to the completion of the three-dimensional structure. This research will investigate a new complex which may lead to the development of new antibacterial drugs.

Center for Macromolecular Crystallography
Lawrence J. DeLucas, Director
Birmingham, Alabama

National Aeronautics and Space Administration

George C. Marshall Space Flight Center
Huntsville, Alabama

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